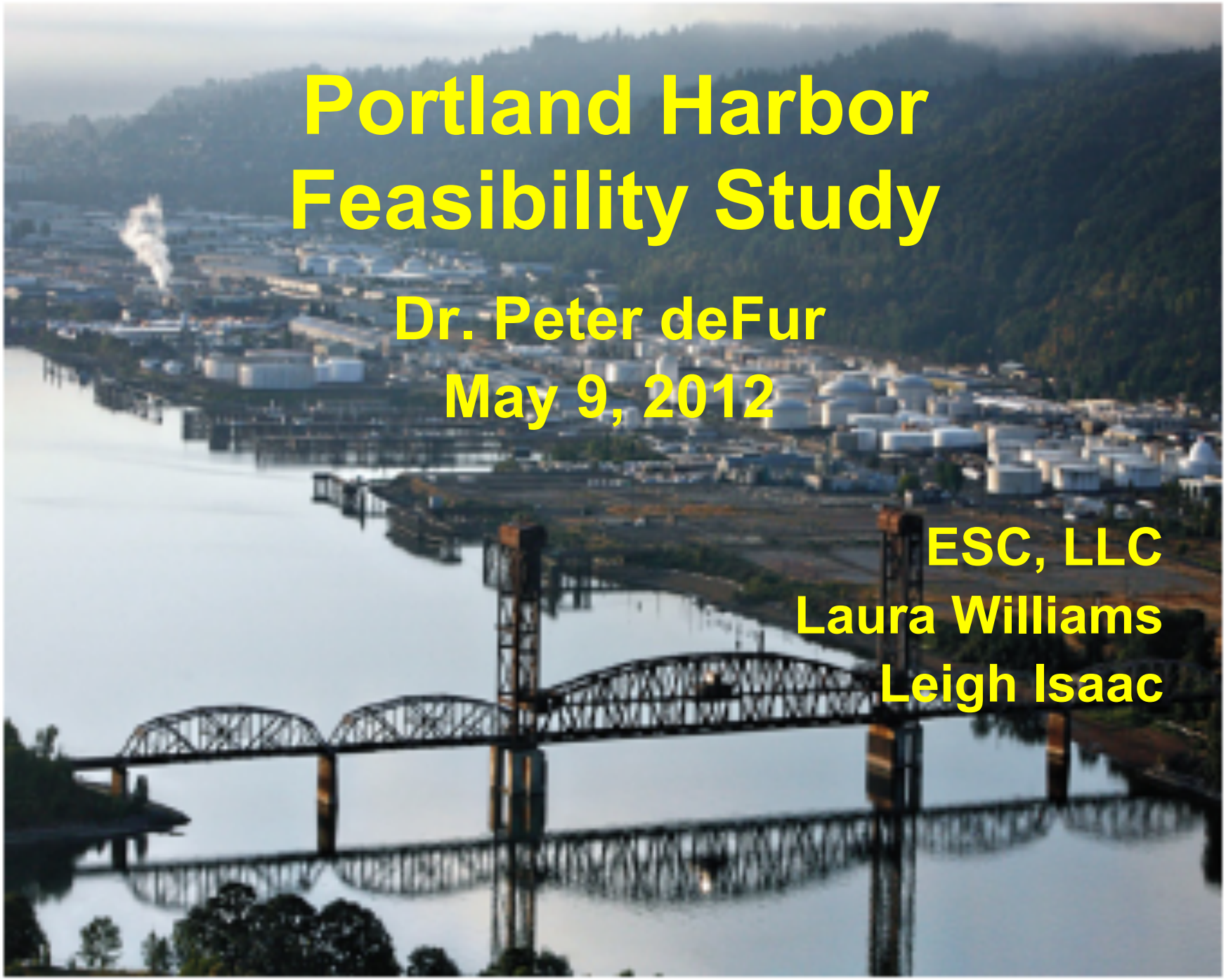


Portland Harbor Feasibility Study

Dr. Peter deFur

May 9, 2012

ESC, LLC

Laura Williams

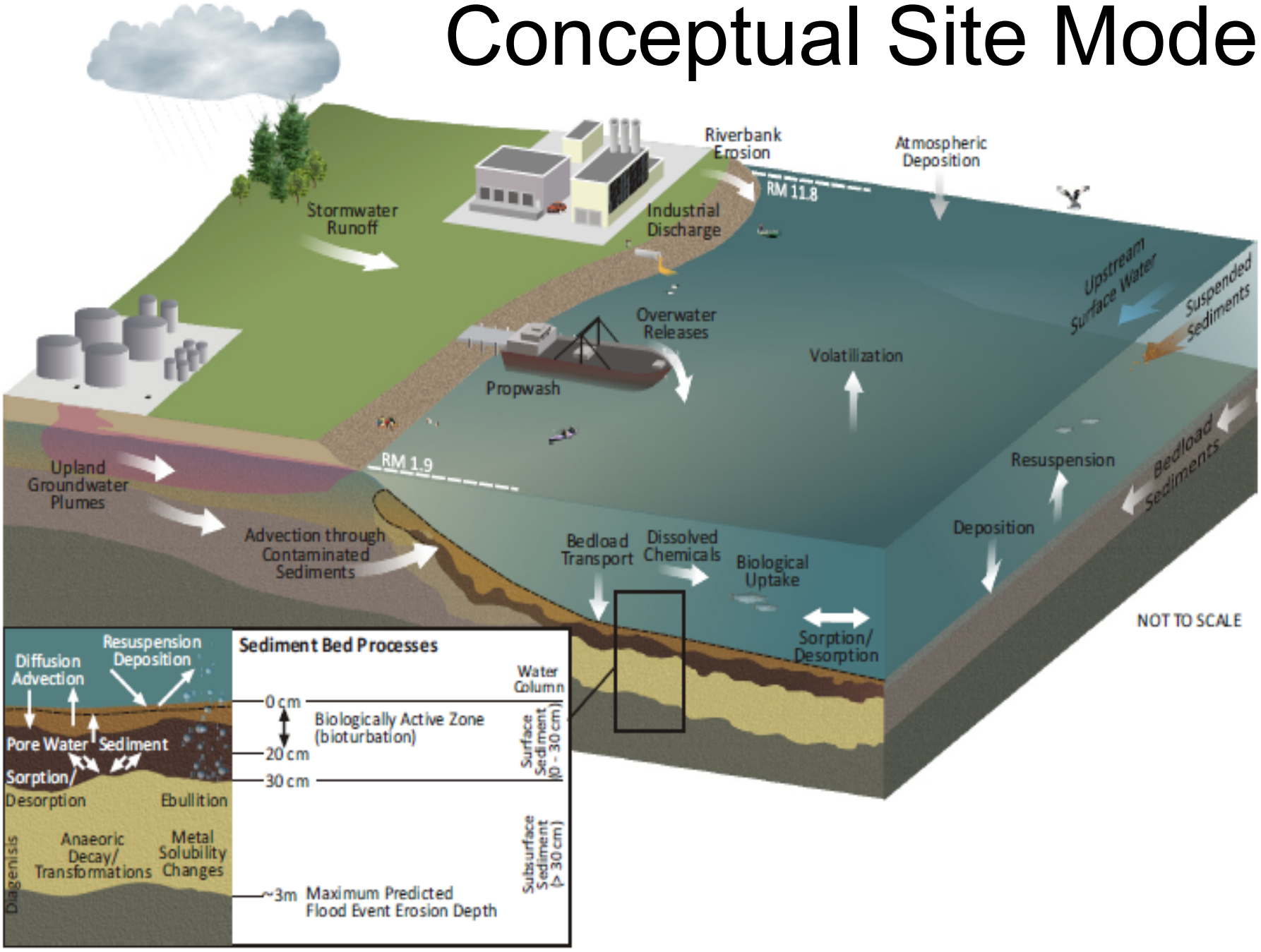
Leigh Isaac

Site Remediation

Currently:
Remedial Investigation and Feasibility Study

1997 - 2000	2001 - 2012			
EPA Conducts Identification	**LWG Conducts Investigation**	**EPA Issues Record of Decision**	**Remedial Actions by Performing Parties**	**EPA Completion**
Preliminary Assessment Site Inspection	**Remedial Inv. (RI)/ Feasibility Study (FS)**	**Record of Decision (ROD)**	**Remedial Design (RD)/ Remedial Action (RA)**	**Closeout**
• Discovery • Inspection • Hazard Ranking • Listing	• 2001 LWG begins early work • 2002-06 Remedial Investigation Sampling • 2007 Site Characterization Summary and Data Gaps Analysis Report submitted to EPA • 2009 Draft Remedial Investigation and Risk Assessments submitted to EPA • 2012 Draft Feasibility Study Report expected to be submitted to EPA	• Proposed Plan • Selection of Remedy	• Interim Design • Final Design • Construction	• Operation/ Maintenance • Long Term Monitoring
Past Tasks	Ongoing Tasks	Future Tasks	Future Tasks	Future Tasks

Conceptual Site Model



Remedial Action Objectives

Human Health

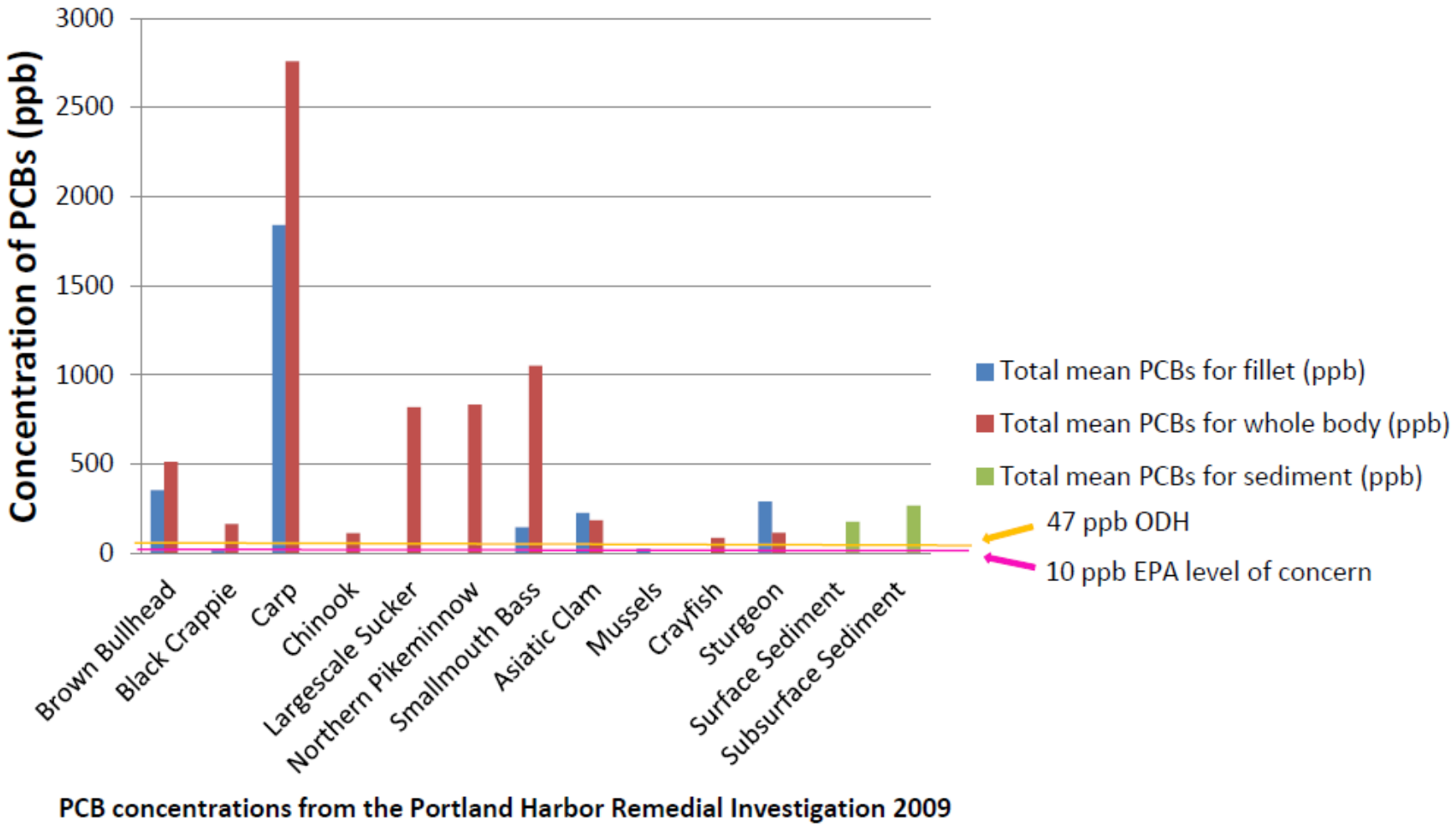
- RAO 1 Sediments: Reduce
- RAO 2 Biota Ingestion: Reduce
- RAO 3 Surface Water: Met (LWG)
- RAO 4 Groundwater: Reduce

Remedial Action Objectives

Ecological

- RAO 5 Sediments: Reduce
- RAO 6 Biota Ingestion: Reduce
- RAO 7 Surface Water: Met (LWG)
- RAO 8 Groundwater: Reduce

PCBs in the Portland Harbor



PCB concentrations from the Portland Harbor Remedial Investigation 2009

Sediment Contaminants of Concern

Bounding Indicator Chemicals:

- PCBs: historical
- Dioxin/furans: same up and downstream
- DDx: historical
- PAH: historical

Metals?

- Portland Harbor is a leader in the metals, manufacturing and transportation industry
- None site-wide
- Remedial Investigation: high in subsurface
- High concentrations:
  - Transition Zone Water
  - Multiple riverbank erosion sites
  - Arkema site

Metals?

- None site-wide
- High concentrations:
  - Riverbed erosion
  - Arkema site – such as arsenic; aluminum and iron are common in soil/rock; manganese

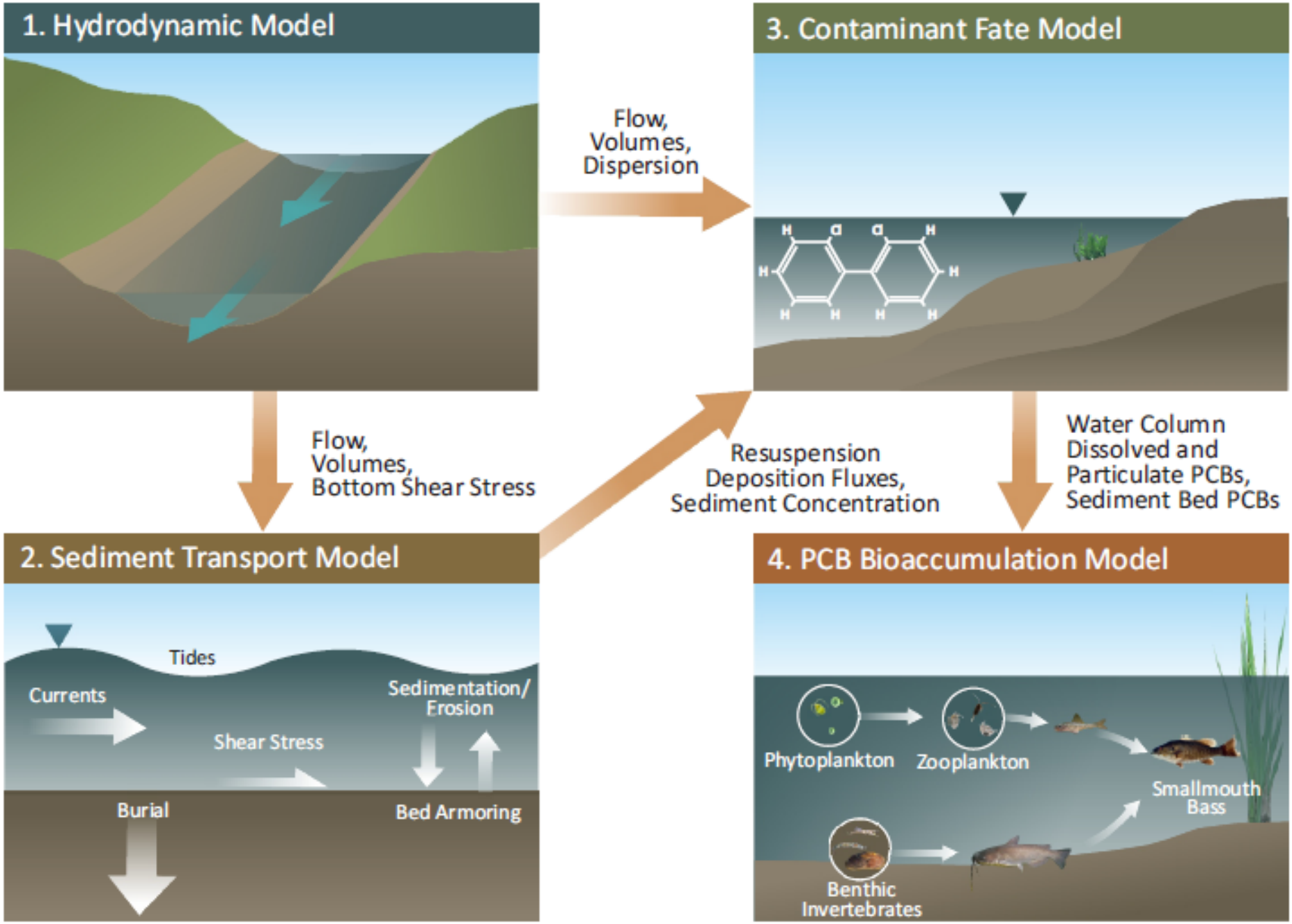

1. Hydrodynamic Model
Flow,
Volumes,
Dispersion
3. Contaminant Fate Model
Flow,
Volumes,
Bottom Shear Stress
Resuspension
Deposition Fluxes,
Sediment Concentration
Water Column
Dissolved and
Particulate PCBs,
Sediment Bed PCBs
2. Sediment Transport Model
Tides
Currents
Sedimentation/
Erosion
Shear Stress
Burial
Bed Armoring
4. PCB Bioaccumulation Model
Phytoplankton
Zooplankton
Smallmouth
Bass
Benthic
Invertebrates

Figure 11 Monitored Natural Recovery

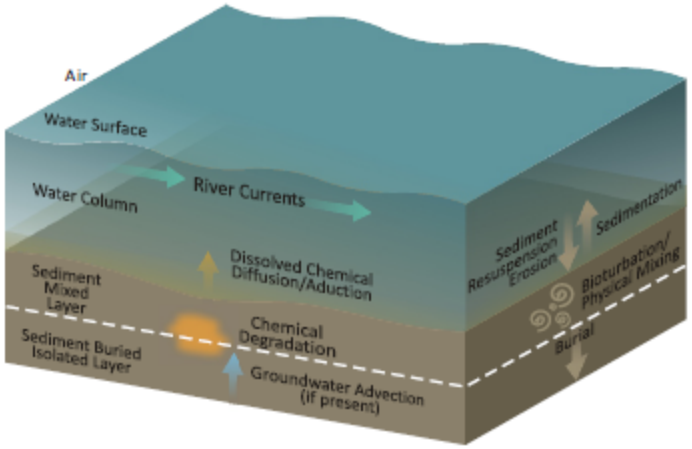


Figure 12 In-place Technologies: Enhanced Monitored Natural Recovery

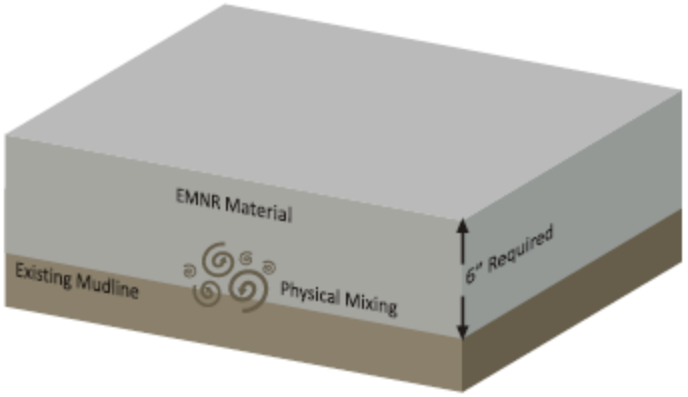


Figure 13 In-place Technologies: In-Situ Treatment

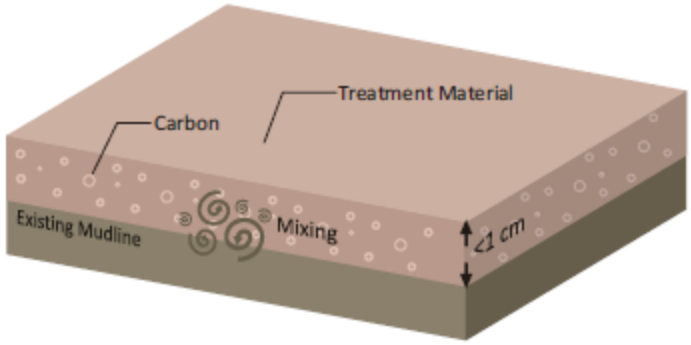


Figure 14 In-place Technologies: Typical Cap

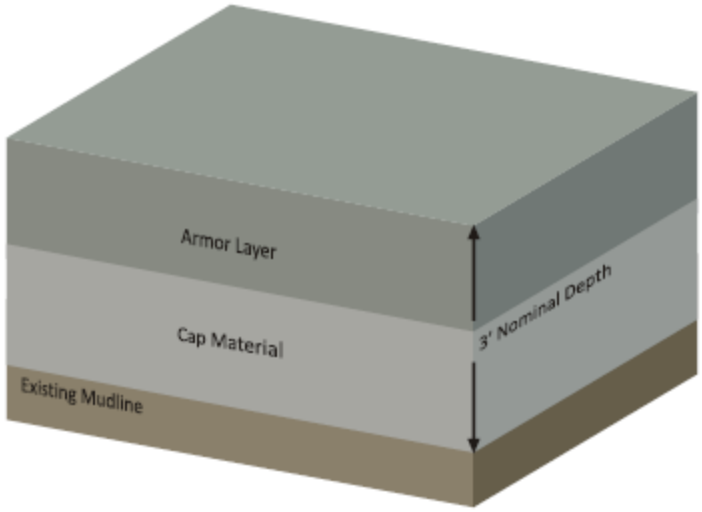


Figure 15 Removal Technologies: Hydraulic Dredge

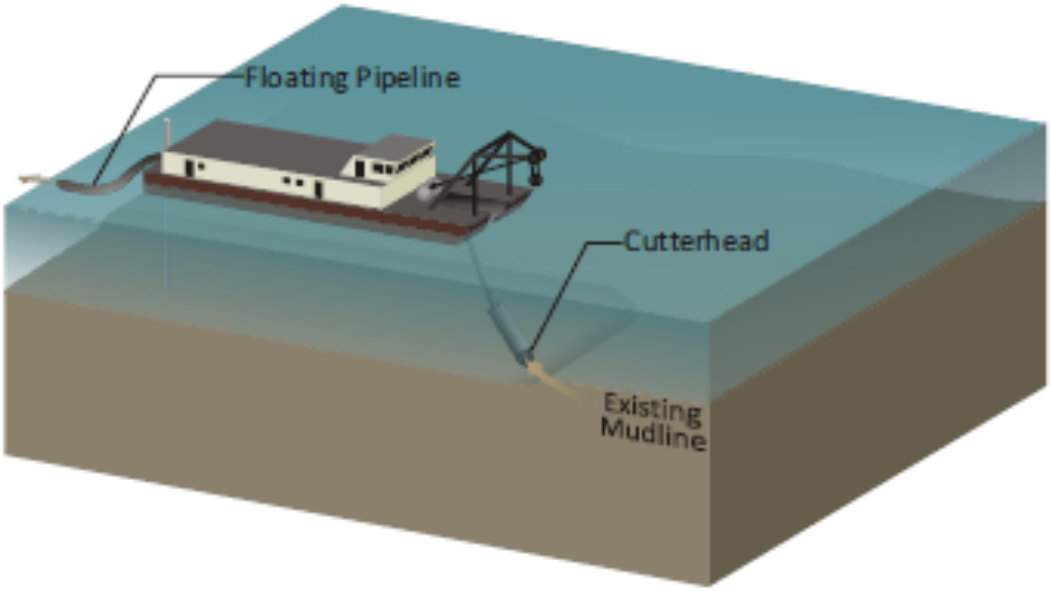
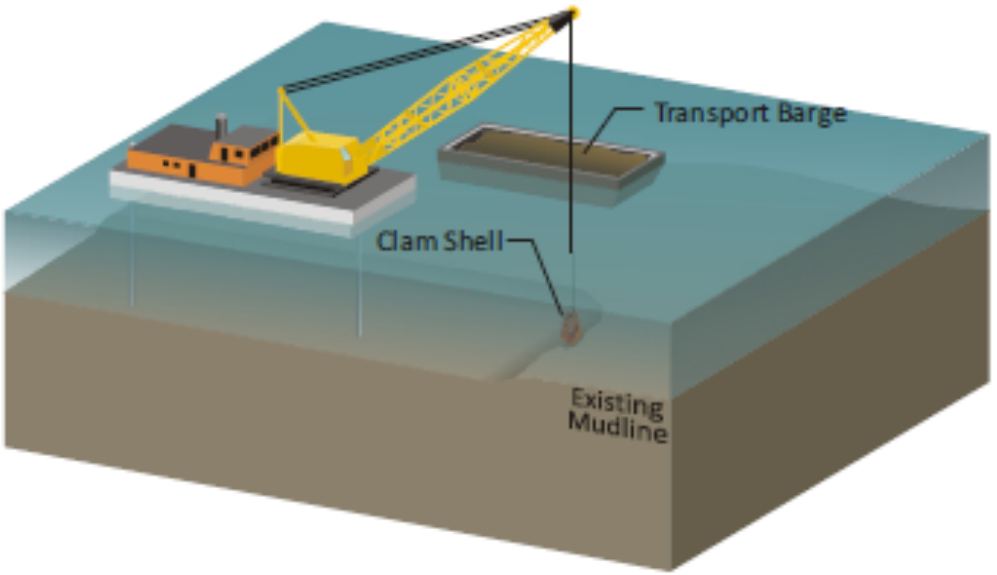


Figure 16 Removal Technologies: Mechanical Dredge

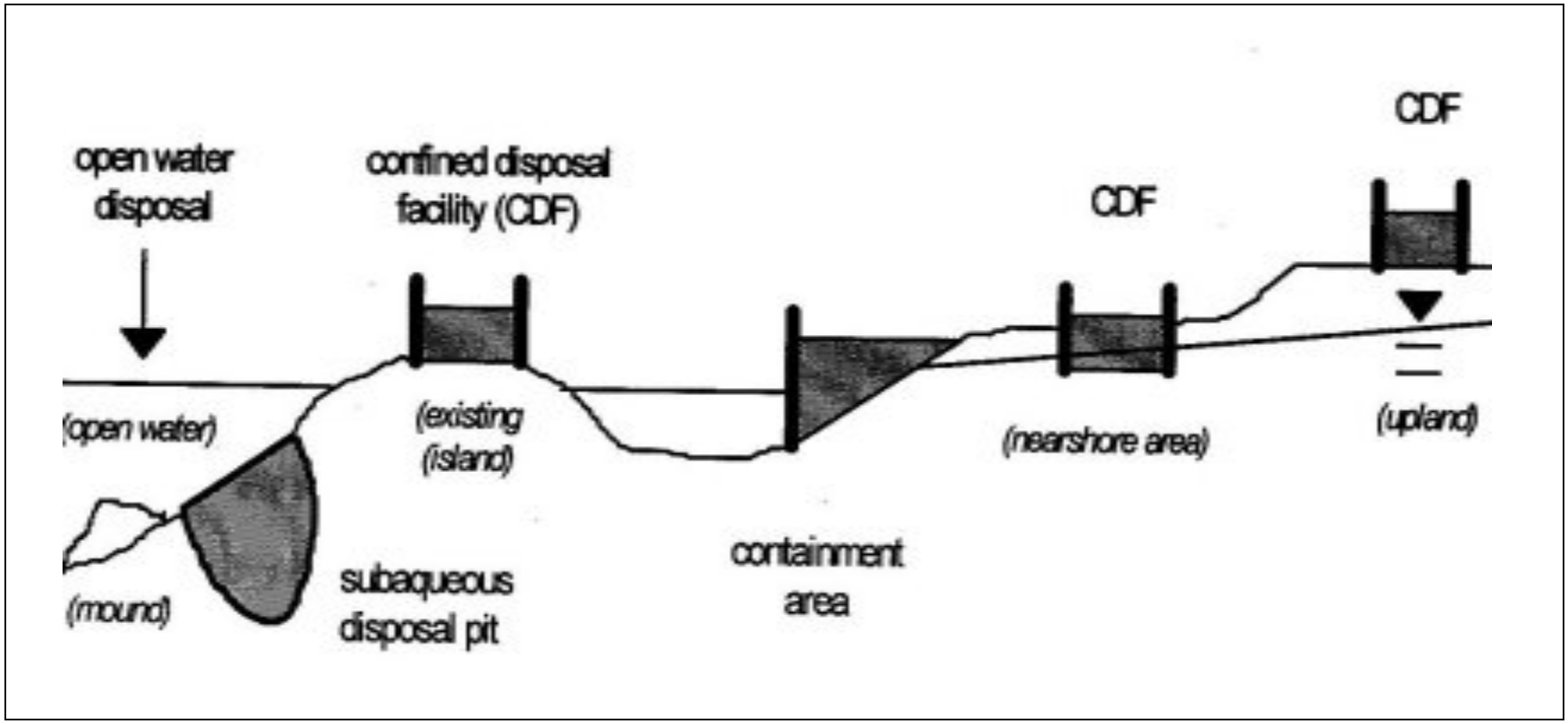


Sedimentation

Rate and Location
Confined Disposal Facility

Recommend: Probabilistic

Confined Disposal Facility



epa.gov

Figure 18 Post-Removal Technologies: Nearshore Confined Disposal

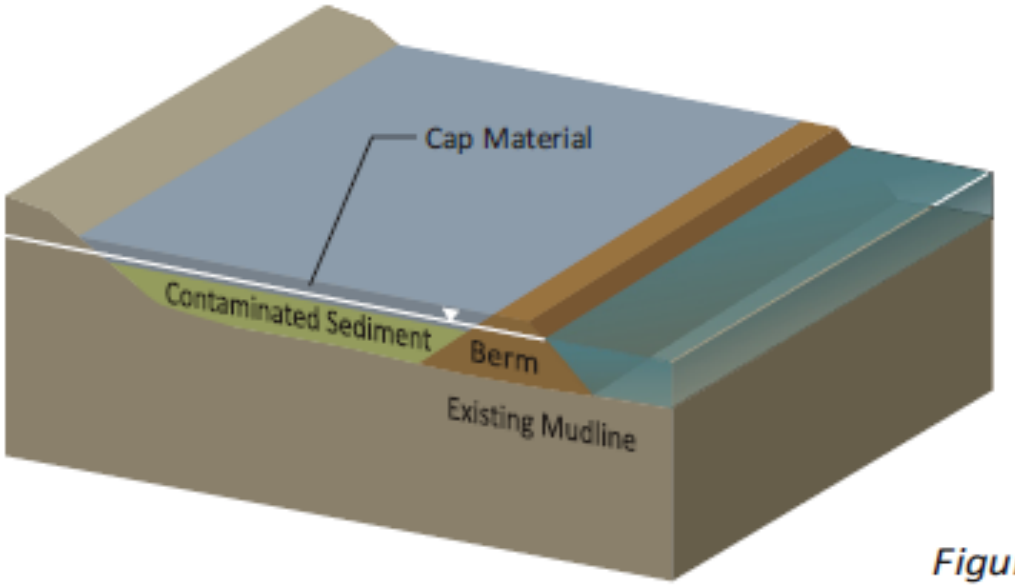


Figure 20 Post-Removal Technologies: Upland Confined Disposal

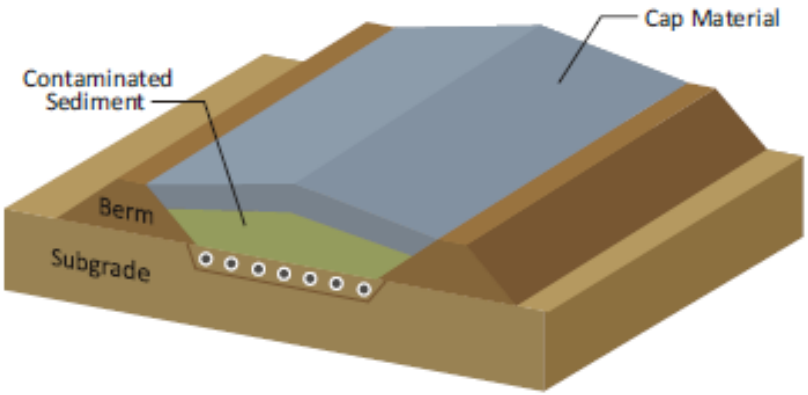
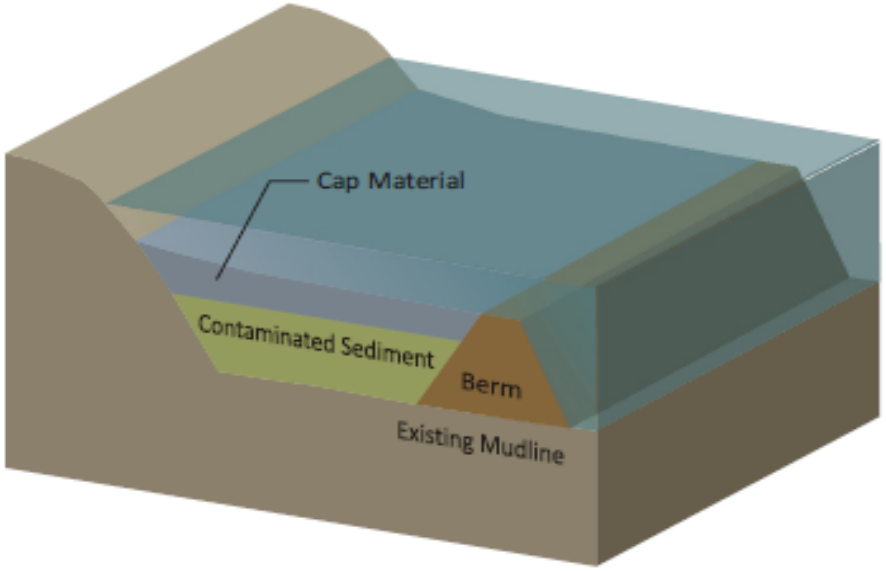


Figure 19 Post-Removal Technologies: Confined Aquatic Disposal

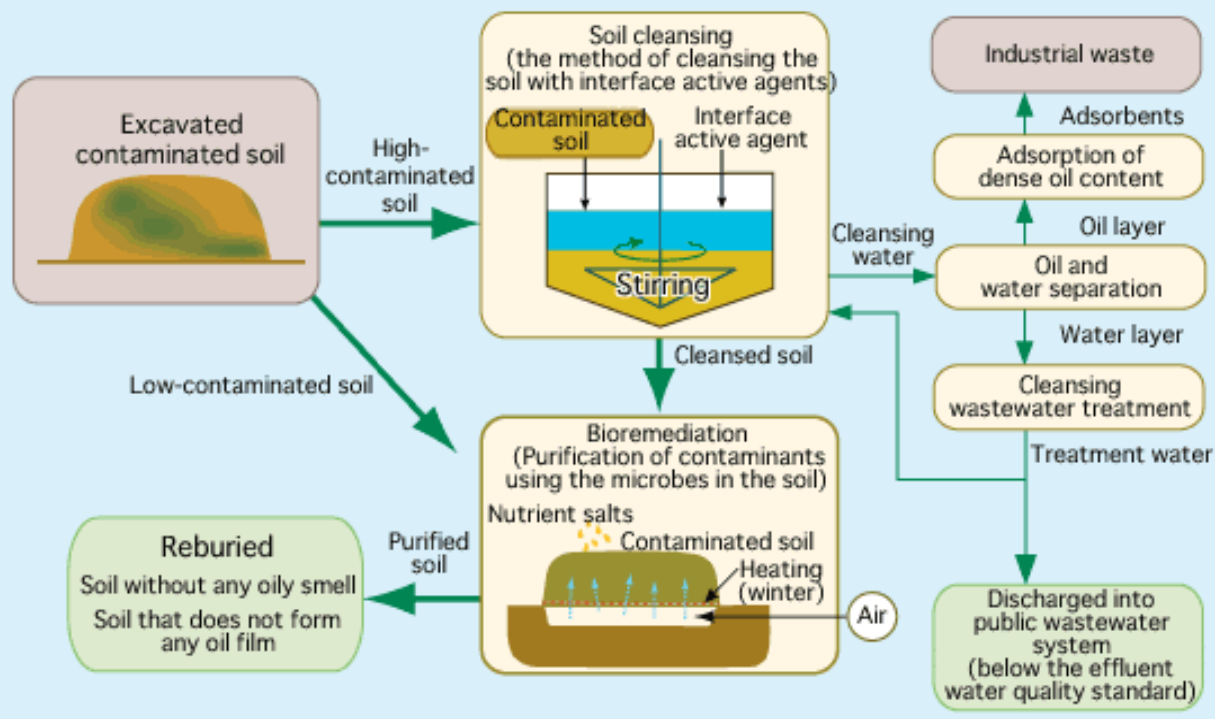


IN-WATER DISPOSAL

- Clearly specify aggressive measures to meet water quality standards during construction (Appendix Jb: Evaluation of potential water quality impacts from in-water disposal alternatives)

- Seismic hazards should be fully evaluated prior to the remedial design phase as there is much concern and uncertainty about this technology (Appendix Jc: Seismic assessment of CDF designs)

Sediment Treatment Options



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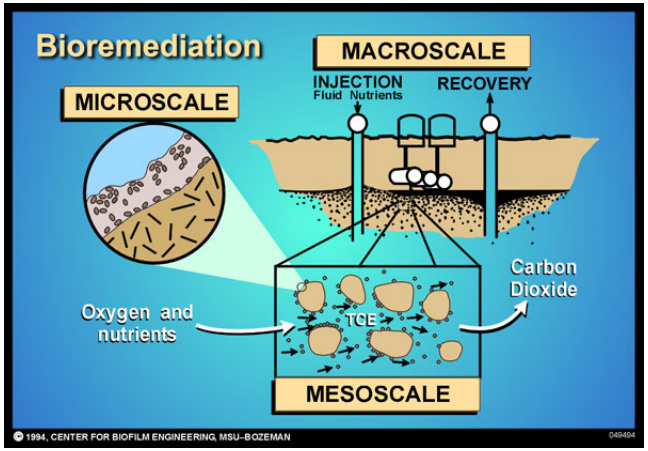
Soil Washing
Bioremediation



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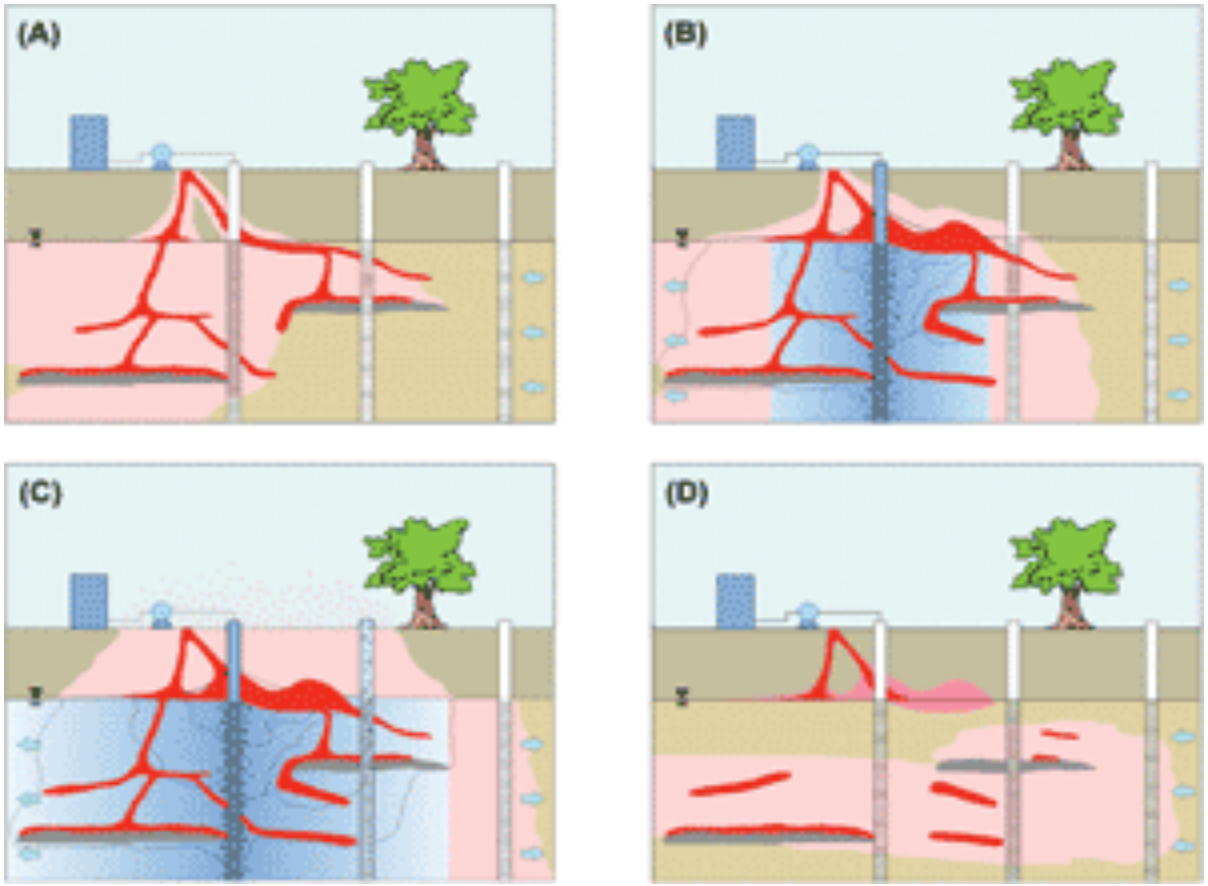
In-situ Treatment Options

- Chemical oxidation
  - Injections that transform contaminants



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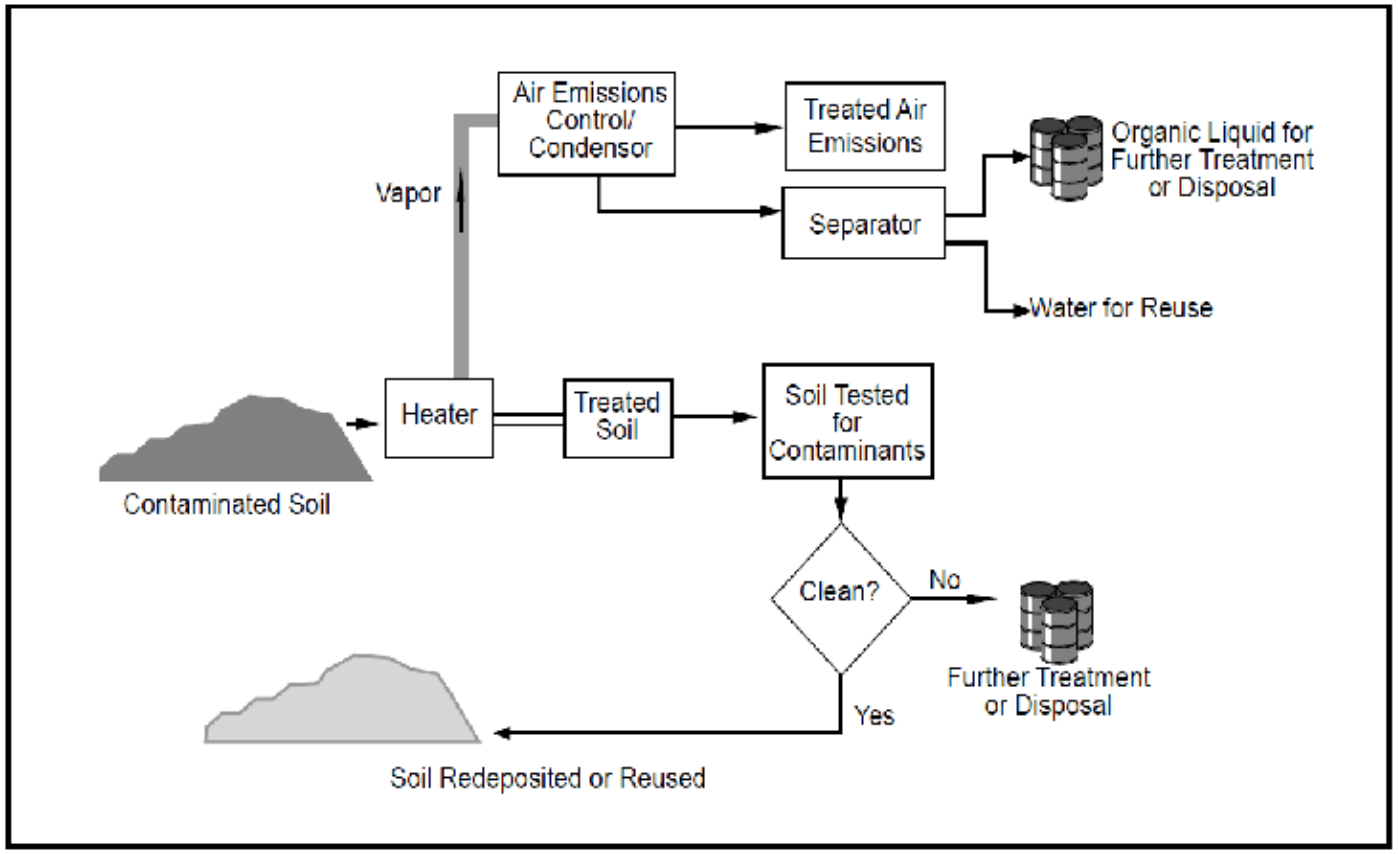
Sediment Treatment Options

Thermal Desorption



EPA 1996

LONG-TERM MONITORING

- Remediation goals may be changed to "more achievable objectives." Need opportunity for public input and to ensure that modified objectives will remain as protective to human/wildlife health (Appendix T: Long-Term Monitoring and Contingency Program Outline)

- Explain the process and protocol through which decision-makers may "alternatively assess" whether a goal has been achieved (Appendix T)

Human Health Risk Assessment

Major findings:

- Highest risk: Consumption of resident fish
- PCBs major contributor
- Direct contact risk low, with exceptions

Baseline Ecological Risk Assessment

89 chemicals potentially pose unacceptable risk

- Primary risks to wildlife due to:
- PCBs, DDx, TEQ (PCB and dioxin/furan), zinc, naphthalene, benzo(a)anthracene, benzo(a)pyrene
- 7% of site poses risk to benthic community based on chemical mixture

ALTERNATIVES

Modeling natural attenuation of groundwater plumes is not beyond the scope of the FS (Appendix U: Additional Analysis to Support Comparative Evaluation of Alternatives)

How, and at what point in the cleanup process, would technical impracticalities in reaching MCLs be established? (Appendix U)

Alternatives

- None attain all COC water quality criteria standards
  - Upstream concentrations already exceed these
  - Fish consumption advisories will remain at the Site
  - Resident fish advisories remain for the entire River
- None attain PCB Remediation Goals for human health (fish consumption)
  - “technically infeasible”

Alternatives

The FS concludes that, no matter the alternative chosen…

- Site surface sediment quality = upstream sediment quality
- Surface sediment concentration:
  - Active remediation = Natural recovery
  - Due to source control only

What's the point of choosing a remediation plan?

REMEDIAL GOAL DEVELOPMENT

Listed tables are not included in Appendix Da

A more appropriate and nuanced method for deriving PRGs for contaminant-species pairs should be used. The current approach leaves many contaminant-species pairs unconsidered for further exposure risks (Da)

EVALUATION OF ALTERNATIVES

- Modeling natural attenuation of groundwater plumes is not beyond the scope of the FS (U)
- How, and at what point in the cleanup process, would technical impracticalities in reaching MCLs be established? (U)
- Much depends on the sedimentation and what the river will do in the future!!!!!
- The site is large enough for some trials and piloting new methods!!!

General Final Comments

- Include language to ensure opportunities for public input throughout the remedial design process
- Any technology that is chosen needs to be thoroughly evaluated before proposed as a part of a cleanup option
- Vague descriptions about technologies and long-term monitoring plans need to be clarified


Questions?